NAME-RAJVEER ARORA, UID-23BCC70023, SUB-ADBMS

EXPERIMENT-02

- **AIM:-** To design a normalized academic schema (up to 3NF) for managing departments and their courses, populate it with meaningful sample data, query departments offering more than two courses using a subquery, and implement access control using Data Control Language (DCL).
- **THEORY:-**

 Normalization (3NF):The Third Normal Form eliminates transitive dependencies. A relation is in 3NF if it is in 2NF and no transitive functional dependency exists between non-prime attributes.

 Relational Model Design:

 Departments table holds unique department data.

 Courses table associates each course with exactly one department via a foreign key.

 Subqueries:

A subquery is a query nested inside another SQL query. It helps in filtering, transforming, or summarizing data based on related conditions.

Access Control using DCL:

Data Control Language statements like GRANT manage user privileges. Granting SELECT access ensures a user can view but not modify data.

- **CODE:-**

```
-- Drop if exists for clean re-execution
DROP TABLE IF EXISTS Courses;
DROP TABLE IF EXISTS Departments;

-- Create Departments table
CREATE TABLE Departments ( dept_id INT
PRIMARY KEY, dept_name VARCHAR(50)
UNIQUE NOT NULL
);

-- Create Courses table
CREATE TABLE Courses ( course_id INT
PRIMARY KEY, course_name
VARCHAR(100) NOT NULL, dept_id INT
NOT NULL,
  FOREIGN KEY (dept_id) REFERENCES Departments(dept_id) ON
```

DELETE CASCADE
);

 INSERTION OF DATA:

-- Insert Departments

INSERT INTO Departments (dept_id, dept_name) VALUES
(1, 'Computer Science'),
(2, 'Electrical'),
(3, 'Mechanical'),
(4, 'Civil'),
(5, 'Electronics');

-- Insert Courses

INSERT INTO Courses (course_id, course_name, dept_id) VALUES
(101, 'DBMS', 1),
(102, 'Operating Systems', 1),
(103, 'Power Systems', 2),
(104, 'Digital Circuits', 2),
(105, 'Thermodynamics', 3),
(106, 'Fluid Mechanics', 3),
(107, 'Structural Engineering', 4),
(108, 'Surveying', 4),
(109, 'Embedded Systems', 5),
(110, 'VLSI Design', 5);

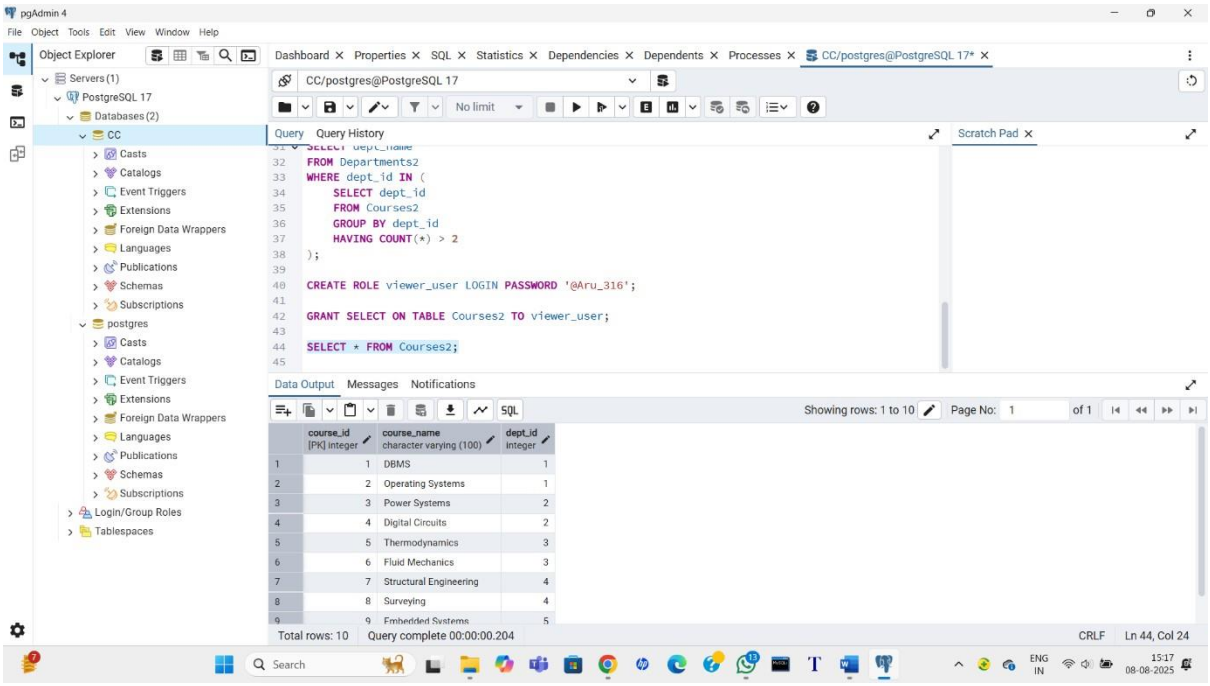
-- Insert Courses if more than 2 courses

```
SELECT dept_name
FROM Departments
WHERE dept_id IN (
   SELECT dept_id
   FROM Courses
   GROUP BY dept_id
   HAVING COUNT(*) > 2
);
```

-- Grant Access to the user

```
GRANT SELECT ON TABLE Courses TO viewer_user;
```

- **OUTPUTS:-**



- **LEARNING OUTCOMES:-**

- Understand and apply **3NF normalization** in database design. Use **foreign key constraints** to maintain referential integrity.
- Write **subqueries** using `GROUP BY` and `HAVING` to analyze relationships.
- Implement **access control** using `GRANT` statements in PostgreSQL.
- Handle **real-world schema modeling** and data organization tasks efficiently.